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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/520,303	HASSARD ET AL.
	Examiner	Art Unit
	ALEX NOGUEROLA	1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *pre-amndt. of 01/05/2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 9-16* is/are rejected.

7)☒ Claim(s) *8* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 January 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/14/2005*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims1, 3-6, 9-11, 13, and 14 are rejected under 35 U.S.C. 102(e) as being anticipated by Quake et al. (US 6,964,736 B2) ("Quake").

Addressing claim 1, Quake discloses a separating device (abstract; Figures 1; and 4A) for separating components flowing along a channel, the device comprising a main channel (104) branched at a branch point (102) connected to at least two subsidiary channels (106, 108), and voltage control means for controlling a voltage in a region of the branch points to provide potential to electrodes adjacent the branch point (col. 14:06-10).

Quake does not explicitly mention having the voltage control means "provide potential differences of opposing polarity along the subsidiary channels such that the components to be separated are caused to flow from the main channel into a subsidiary channel." However, this limitation is implied because Quake teaches, "The sorting [at the branch point] is accomplished by the processor temporally activating a voltage source connected to the electrode leads **114** and **116** just before or at the time the molecule to be routed enters the junction of the main channel and the two branch channels. The resulting electric field exerts a force on the negatively-charged DNA molecules, biasing it toward the positively-charged electrodes. The molecule will then be carried down the branch channel containing the positively-charged electrode by the bulk solution flow." See col. 14:10-15. Thus, one branch electrode is positively charged while the other branch electrode is implicitly negatively-charged.

Addressing claim 3, the additional limitation of this claim is implied by col. 14:06-10, which discloses that the electrodes are activated by the voltage source depending on whether the molecules to be sorted is just before or has entered the junction.

Addressing claim 4, for the additional limitation of this claim see col. 09:12-36 and col. 12:38-49.

Addressing claim 5, for the additional limitation of this claim see Figures 1 and 7, which shows multiple junctions and col. 14:03-20, which discloses that the processor

temporarily activates a voltage source connected to the branch electrodes to direct molecules into the branches as desired.

Addressing claim 6, for the additional limitation of this claim see col. 08:43-53 and col. 12:57-64, which discloses, respectively, electrophoresis discrimination means, that is, using an electrical field to separate molecules at the branch point and separately causing electroosmotic flow along the main channel by applying an electric field between the inlet end and the outlet end of the channel system.

Addressing claim 9, for the additional limitation of this claim see col. 14:24-30 and col. 12:57:64. Barring a contrary showing, electroosmosis channels are also capable of being used as electrophoresis channels.

Addressing claim 10, for the additional limitation of this claim see col. 06:16-18.

Addressing claim 11, Quake discloses a method of separating an electrically charged component from a mixture, by differential flow along a branched channel structure, the method comprising the steps of:

(i) applying a force to the mixture so as to move the mixture along a main channel of a channel structure to a branch point connecting the main channel to at least two branch channels (Figures 1 and 4a and col. 12:54-64); and

(ii) applying an electrical potential difference to a portion of each branch channel in a region of the branch point, wherein the electrical potential difference applied to a selected branch channel presents a polarity at the branch point which is different from the polarity presented at the branch point by an electrical potential difference applied to another branch channel at the branch point (col. 14:06-10). Quake teaches, "The sorting [at the branch point] is accomplished by the processor temporally activating a voltage source connected to the electrode leads **114** and **116** just before or at the time the molecule to be routed enters the junction of the main channel and the two branch channels. The resulting electric field exerts a force on the negatively-charged DNA molecules, biasing it toward the positively-charged electrodes. The molecule will then be carried down the branch channel containing the positively-charged electrode by the bulk solution flow." See col. 14:10-15. Thus, one branch electrode is positively charged while the other branch electrode is implicitly negatively-charged.

Addressing claims 13 and 14, for the additional limitations of these claims see col. 12:50-64.

3. Claims 1, 3-6, 9-11, 13, and 14 are rejected under 35 U.S.C. 102(e) as being anticipated by Quake et al. (WO 99/61888 A2) ("Quake II").

Addressing claim 1, Quake II discloses a separating device (abstract and Figure 4A) for separating components flowing along a channel, the device comprising a main channel (104) branched at a branch point (102) connected to at least two subsidiary channels (106, 108), and voltage control means for controlling a voltage in a region of the branch points to provide potential (page 37:24 – page 38:05)

Quake does not explicitly mention having the voltage control means "provide potential differences of opposing polarity along the subsidiary channels such that the components to be separated are caused to flow from the main channel into a subsidiary channel." However, this limitation is implied because the voltage source is a DC voltage source (page 62:10 – page 64:15) and Quake teaches, "... cells are directed into one or another of a pair of outlet channels by electrodes that apply an electric field across the branch point, which effectively directs a particular cell into a predetermined outlet branch channel." See page 06:14-17. Thus, implicitly one branch electrode is positively charged while the other branch electrode is negatively-charged.

Addressing claim 3, the additional limitation of this claim is implied by page 47:06-20, which discloses that how the electrodes are activated depends on signals from the optical detector that monitors the flow of particles.

Addressing claim 4, the additional limitation of this claim see page 47:06-20.

Addressing claim 5, for the additional limitation of this claim see Figure 5, which shows multiple junctions and page 47:06-20, which discloses that the processor activates a voltage source connected to the branch electrodes to direct molecules into the branches as desired.

Addressing claim 6, for the additional limitation of this claim see page 37:21 – page 38:09 and col. 08:43-53 and page 28:10-17, which discloses, respectively, electrophoresis discrimination means, that is, using an electrical field to separate molecules at the branch point and separately causing electroosmotic flow along the main channel by applying an electric field between the inlet end and the outlet end of the channel system.

Addressing claim 9, for the additional limitation of this claim see page 14:15-20.

Addressing claim 10, for the additional limitation of this claim see page 09:27 – page 10:02.

Addressing claim 11, Quake II discloses a method of separating an electrically charged component from a mixture, by differential flow along a branched channel structure, the method comprising the steps of:

(i) applying a force to the mixture so as to move the mixture along a main channel of a channel structure to a branch point connecting the main channel to at least two branch channels (page 14:06-20 and Figures 4A and 14A); and

(ii) applying an electrical potential difference to a portion of each branch channel in a region of the branch point, wherein the electrical potential difference applied to a selected branch channel presents a polarity at the branch point which is different from the polarity presented at the branch point by an electrical potential difference applied to another branch channel at the branch point (page 37:24 – page 38:05). Quake teaches that voltage source is a DC voltage source (page 62:10 – page 64:15) and, "... cells are directed into one or another of a pair of outlet channels by electrodes that apply an electric field across the branch point, which effectively directs a particular cell into a predetermined outlet branch channel." See page 06:14-17. Thus, implicitly one branch electrode is positively charged while the other branch electrode is negatively-charged.

Addressing claims 13 and 14, the additional limitations of these claims see page 14:06-20.

4. Claims 1-4, 7, 9, 11, and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Van den Berg (US 6,508,273 B1).

Addressing claim 1, Van den Berg discloses a separating device (Figure 3) for separating components flowing along a channel, the device comprising a main channel (14) branched at a branch point (Figure 3) connected to at least two subsidiary channels (15, 16), and voltage control means for controlling a voltage in a region of the branch points to provide potential differences of opposing polarity along the subsidiary channels such that the components to be separated are caused to flow from the main channel into a subsidiary channel (implied by col. 06:14-45, especially Table 1, which discloses potential differences of opposing polarities applied to the branch electrodes).

Addressing claim 2, the additional limitations of this claim is implied by col. 06:14-45, which refers to the electrodes at the junction as forming an electrical switch with which flow can be de diverted by appropriate selection of voltages for the electrodes, and especially by Table 1, which discloses V_{18} and V_{19} having opposite polarities in the second and third columns.

Addressing claim 3, for the additional limitations of this claim see col. 06:22-45.

Addressing claim 4, for the additional limitation of this claim see col. 02:65 – col. 03:03

Addressing claim 7, for the additional limitations of this claim see col. 06:14-45, especially Table 1, which discloses that an electrode in the main channel downstream of the branch point may be held at the same potential as an electrode upstream of the branch point.

Addressing claim 9, for the additional limitation of this claim see col. 01:11-62. Barring a contrary showing, electroosmosis channels are also capable of being used as electrophoresis channels.

Addressing claim 11, Van den Berg discloses a method of separating an electrically charged component from a mixture, by differential flow along a branched channel structure, the method comprising the steps of:

(i) applying a force to the mixture so as to move the mixture along a main channel of a channel structure to a branch point connecting the main channel to at least two branch channels (col. 01:01 – col. 021); and

(ii) applying an electrical potential difference to a portion of each branch channel in a region of the branch point, wherein the electrical potential difference applied to a selected branch channel presents a polarity at the branch point which is

different from the polarity presented at the branch point by an electrical potential difference applied to another branch channel at the branch point (col. 06:14-45).

Addressing claim 13, for the additional limitation of this claim see col. 01:01-62.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 2 and 12 are rejected under 35 U.S.C. 103(a) as being anticipated by Quake et al. (US 6,964,736 B2) ("Quake") in view of Schlenoff et al. (US 6,841,054 B2) ("Schlenoff").

Addressing claim 2, Quake discloses a separating device (abstract; Figures 1; and 4A) for separating components flowing along a channel, the device comprising a main channel (104) branched at a branch point (102) connected to at least two subsidiary channels (106, 108), and voltage control means for controlling a voltage in a region of the branch points to provide potential (col. 14:06-10).

Quake does not explicitly mention having the voltage control means "provide potential differences of opposing polarity along the subsidiary channels such that the components to be separated are caused to flow from the main channel into a subsidiary channel." However, this limitation is implied because Quake teaches, "The sorting [at the branch point] is accomplished by the processor temporally activating a voltage

source connected to the electrode leads **114** and **116** just before or at the time the molecule to be routed enters the junction of the main channel and the two branch channels. The resulting electric field exerts a force on the negatively-charged DNA molecules, biasing it toward the positively-charged electrodes. The molecule will then be carried down the branch channel containing the positively-charged electrode by the bulk solution flow." See col. 14:10-15. Thus, one branch electrode is positively charged while the other branch electrode is implicitly negatively-charged.

Quake also does not explicitly mention having the switchable voltage control means be "... adapted, on switching, to reverse the polarity of the potential differences along each of two subsidiary channels at a branch point so that any one subsidiary channel can be selected to be subject to a different polarity from every other subsidiary channel at that branch point." However, one with ordinary skill in the art at the time of the invention would expect the voltage control means in Quake to have the ability to reverse the potential polarity along each of the subsidiary channels at a branch point because as taught by Schlenoff power supplies used for capillary zone electrophoresis, which would likely be used for the electrodes in the Quake device since the branch electrodes are effectively performing electrophoresis (indeed, Quake refers to the Figure 4A embodiment as "an electrophoresis discrimination means" – col. 08:43-49), preferably allowed for reversing of polarity. See in Schlenoff col. 01:60-65. Clearly Quake does not intend for one of the branch electrodes to just always to have a potential polarity when used and other branch electrodes to just always have a negative polarity when used.

Addressing claim 12, Quake discloses a method of separating an electrically charged component from a mixture, by differential flow along a branched channel structure, the method comprising the steps of:

(i) applying a force to the mixture so as to move the mixture along a main channel of a channel structure to a branch point connecting the main channel to at least two branch channels (Figures 1 and 4a and col. 12:54-64); and

(ii) applying an electrical potential difference to a portion of each branch channel in a region of the branch point, wherein the electrical potential difference applied to a selected branch channel presents a polarity at the branch point which is different from the polarity presented at the branch point by an electrical potential difference applied to another branch channel at the branch point (col. 14:06-10). Quake teaches, "The sorting [at the branch point] is accomplished by the processor temporally activating a voltage source connected to the electrode leads **114** and **116** just before or at the time the molecule to be routed enters the junction of the main channel and the two branch channels. The resulting electric field exerts a force on the negatively-charged DNA molecules, biasing it toward the positively-charged electrodes. The molecule will then be carried down the branch channel containing the positively-charged electrode by the bulk solution flow." See col. 14:10-15. Thus, one branch electrode is positively charged while the other branch electrode is implicitly negatively-charged.

Quake does not mention "the steps of reversing the polarity presented by the electrical potential difference applied to the selected branch channel, and reversing the polarity at the branch point, so as to change the selected branch element from a first to

a second branch channel." As a first matter, one would expect the voltage control means in Quake to have the ability to reverse the potential polarity along each of the subsidiary channels at a branch point because as taught by Schlenoff power supplies used for capillary zone electrophoresis, which would likely be used for the electrodes in the Quake device since the branch electrodes are effectively performing electrophoresis (indeed, Quake refers to the Figure 4A embodiment as "an electrophoresis discrimination means" – col. 08:43-49), preferably allowed for reversing of polarity. See in Schlenoff col. 01:60-65. Quake also discloses providing "a cascade of detection and discrimination regions suitable for successive rounds of polynucleotide or cell sorting." See col. 06:16-18. So barring a contrary showing, such as unexpected results, the additional steps of claim 12 are just a matter of programming the voltage controller(s) so that the mixture components will be sorted out in a desired fashion. It may be desirable to, at least at an initial branch point, direct two types of molecules that are oppositely charged down the same branch because they have some moiety in common, such as, a carbohydrate unit, or they have the same lengths.

9. Claims 2 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Quake et al. (WO 99/61888 A2) ("Quake II") in view of Schlenoff et al. (US 6,841,054 B2) ("Schlenoff").

Addressing claim 2, Quake II discloses a separating device (abstract and Figure 4A) for separating components flowing along a channel, the device comprising a main channel (104) branched at a branch point (102) connected to at least two subsidiary channels (106, 108), and voltage control means for controlling a voltage in a region of the branch points to provide potential (page 37:24 – page 38:05)

Quake does not explicitly mention having the voltage control means "provide potential differences of opposing polarity along the subsidiary channels such that the components to be separated are caused to flow from the main channel into a subsidiary channel." However, this limitation is implied because the voltage source is a DC voltage source (page 62:10 – page 64:15) and Quake teaches, "... cells are directed into one or another of a pair of outlet channels by electrodes that apply an electric field across the branch point, which effectively directs a particular cell into a predetermined outlet branch channel." See page 06:14-17. Thus, implicitly one branch electrode is positively charged while the other branch electrode is negatively-charged.

Quake also does not explicitly mention having the switchable voltage control means be "... adapted, on switching, to reverse the polarity of the potential differences along each of two subsidiary channels at a branch point so that any one subsidiary channel can be selected to be subject to a different polarity from every other subsidiary channel at that branch point." However, one with ordinary skill in the art at the time of

the invention would expect the voltage control means in Quake to have the ability to reverse the potential polarity along each of the subsidiary channels at a branch point because as taught by Schlenoff power supplies used for capillary zone electrophoresis, which would likely be used for the electrodes in the Quake device since the branch electrodes are effectively performing electrophoresis and Quake also discloses flowing the materials through the channels using electro-osmotic and/or electrophoresis forces (page 62:05-09), preferably allowed reversing of polarity. See in Schlenoff col. 01:60-65. Clearly Quake does not intend for one of the branch electrodes to just always to have a potential polarity when used and other branch electrodes to just always have a negative polarity when used.

Addressing claim 12, Quake II discloses a method of separating an electrically charged component from a mixture, by differential flow along a branched channel structure, the method comprising the steps of:

(i) applying a force to the mixture so as to move the mixture along a main channel of a channel structure to a branch point connecting the main channel to at least two branch channels (page 14:06-20 and Figures 4A and 14A); and

(ii) applying an electrical potential difference to a portion of each branch channel in a region of the branch point, wherein the electrical potential difference applied to a selected branch channel presents a polarity at the branch point which is different from the polarity presented at the branch point by an electrical potential difference applied to another branch channel at the branch point (page 37:24 – page 38:05). Quake teaches that voltage source is a DC voltage source (page 62:10 – page 64:15) and, "... cells are directed into one or another of a pair of outlet channels by electrodes that apply an electric field across the branch point, which effectively directs a particular cell into a predetermined outlet branch channel." See page 06:14-17. Thus, implicitly one branch electrode is positively charged while the other branch electrode is negatively-charged.

Quake II does not mention "the steps of reversing the polarity presented by the electrical potential difference applied to the selected branch channel, and reversing the polarity at the branch point, so as to change the selected branch element from a first to a second branch channel." As a first matter, one would expect the voltage control means in Quake to have the ability to reverse the potential polarity along each of the subsidiary channels at a branch point because as taught by Schlenoff power supplies used for capillary zone electrophoresis, which would likely be used for the electrodes in the Quake device since the branch electrodes are effectively performing electrophoresis, preferably allowed reversing of polarity. See in Schlenoff col. 01:60-65. Quake also discloses providing "a cascade of detection and discrimination regions suitable for successive rounds of polynucleotide or cell sorting." See page 05:27 –

page 10:02. So barring a contrary showing, such as unexpected results, the additional steps of claim 12 are just a matter of programming the voltage controller(s) so that the mixture components will be sorted out in a desired fashion. It may be desirable to, at least at an initial branch point, direct two types of molecules that are oppositely charged down the same branch because they have some moiety in common, such as, a carbohydrate unit, or they have the same lengths.

10. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Van den Berg (US 6,508,273 B1) in view of Schlenoff et al. (US 6,841,054 B2) ("Schlenoff").

Van den Berg discloses a separating device (Figure 3) for separating components flowing along a channel, the device comprising a main channel (14) branched at a branch point (Figure 3) connected to at least two subsidiary channels (15, 16), and voltage control means for controlling a voltage in a region of the branch points to provide potential differences of opposing polarity along the subsidiary channels such that the components to be separated are caused to flow from the main channel into a subsidiary channel (implied by col. 06:14-45, especially Table 1, which discloses potential differences of opposing polarities applied to the branch electrodes).

Van den Berg does not explicitly mention having the switchable voltage control means be "... adapted, on switching, to reverse the polarity of the potential differences along each of two subsidiary channels at a branch point so that any one subsidiary

channel can be selected to be subject to a different polarity from every other subsidiary channel at that branch point." However, this is implied one with ordinary skill in the art at the time of the invention would expect the voltage control means in Quake to have the ability to reverse the potential polarity along each of the subsidiary channels at a branch point because as taught by Schlenoff power supplies used for capillary zone electrophoresis, which would likely be used for the electrodes in the Quake device since the branch electrodes are effectively performing electrophoresis and Quake also discloses flowing the materials through the channels using electro-osmotic and/or electrophoresis forces (page 62:05-09), preferably provided for allowing reversing of polarity. See in Schlenoff col. 01:60-65. Clearly Quake does not intend for one of the branch electrodes to just always to have a potential polarity when used and other branch electrodes to just always have a negative polarity when used.

11. Claims 5 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van den Berg (US 6,508,273 B1) in view of Quake et al. (US 6,964,736 B2) ("Quake").

Addressing claim 5, Van den Berg discloses a separating device (Figure 3) for separating components flowing along a channel, the device comprising a main channel (14) branched at a branch point (Figure 3) connected to at least two subsidiary channels (15, 16), and voltage control means for controlling a voltage in a region of the branch points to provide potential differences of opposing polarity along the subsidiary channels

such that the components to be separated are caused to flow from the main channel into a subsidiary channel (implied by col. 06:14-45, especially Table 1, which discloses potential differences of opposing polarities applied to the branch electrodes).

Van den Berg does not mention having the main branch channel be branched at more than on branch point. However, barring evidence to the contrary, such as unexpected results, this is just multiplication of parts for multiplied effect. For example, Quake discloses a separating device (abstract; Figures 1; and 4A) for separating components flowing along a channel, the device comprising a main channel (104) branched at a branch point (102) connected to at least two subsidiary channels (106, 108), and voltage control means for controlling a voltage in a region of the branch points to provide potential to electrodes adjacent the branch point. (col. 14:06-10). Quake further discloses having the main branch channel be branched at more than one branch point. See Figure 7. It would have been obvious to one with ordinary skill in the art at the time of the invention to have the main branch channel be branched at more than one branch point as taught by Quake in the invention of Van den Berg because this will allow successive finer levels of discrimination among the sample components.

Addressing claim 10, Van den Berg discloses a separating device (Figure 3) for separating components flowing along a channel, the device comprising a main channel (14) branched at a branch point (Figure 3) connected to at least two subsidiary channels

(15, 16), and voltage control means for controlling a voltage in a region of the branch points to provide potential differences of opposing polarity along the subsidiary channels such that the components to be separated are caused to flow from the main channel into a subsidiary channel (implied by col. 06:14-45, especially Table 1, which discloses potential differences of opposing polarities applied to the branch electrodes).

Van den Berg does not mention having the main branch channel be branched at more than on branch point. However, barring evidence to the contrary, such as unexpected results, this is just multiplication of parts for multiplied effect. For example, Quake discloses a separating device (abstract; Figures 1; and 4A) for separating components flowing along a channel, the device comprising a main channel (104) branched at a branch point (102) connected to at least two subsidiary channels (106, 108), and voltage control means for controlling a voltage in a region of the branch points to provide potential to electrodes adjacent the branch point. (col. 14:06-10). Quake further discloses having the main branch channel be branched at more than one branch point creating multiple detection and discrimination regions. See Figure 7 and col. 06:16-18. It would have been obvious to one with ordinary skill in the art at the time of the invention to have the main branch channel be branched at more than one branch point as taught by Quake in the invention of Van den Berg because this will allow successive finer levels of discrimination among the sample components.

12. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Quake et al. (WO 99/61888 A2) ("Quake II") in view of Troian et al. (US 7,216,660 B2) ("Troian") and Unno (US 7,024,281 B1) ("Unno").

Quake II discloses a method of separating an electrically charged component from a mixture, by differential flow along a branched channel structure, the method comprising the steps of:

(i) applying a force to the mixture so as to move the mixture along a main channel of a channel structure to a branch point connecting the main channel to at least two branch channels (page 14:06-20 and Figures 4A and 14A); and

(ii) applying an electrical potential difference to a portion of each branch channel in a region of the branch point, wherein the electrical potential difference applied to a selected branch channel presents a polarity at the branch point which is different from the polarity presented at the branch point by an electrical potential difference applied to another branch channel at the branch point (page 37:24 – page 38:05). Quake teaches that voltage source is a DC voltage source (page 62:10 – page 64:15) and, "... cells are directed into one or another of a pair of outlet channels by electrodes that apply an electric field across the branch point, which effectively directs a particular cell into a predetermined outlet branch channel." See page 06:14-17. Thus, implicitly one branch electrode is positively charged while the other branch electrode is negatively-charged.

Although Quake II discloses a variety of forces for causing flow (page 14:05-20) Quake II does not mention gravity or centrifugal force. However, as shown by Troian (col. 01:25-35) and Unno (col. 25:09-17), for example, gravity based and centrifugal

force based flow were conventional alternatives to flow caused by electrophoresis force or fluid pressure. Barring a contrary showing it was within the skill of one with ordinary skill in the art at the time of the invention to be able select a force with which to move the fluid from known forces for such purpose. The force would be selected on factors such as the ease of creating the force, nature of the sample (e.g., whether likely to react or decompose under an electrical force), desired flow velocity/ pressure, and whether the flow force should also separate mixture components (electrophoresis).

International Search Report for International application PCT/GB03/02926 ("Search Report")

13. WO9961888A was cited as an "X" reference in the Search Report against claims 1-5 and 9-6 and as a "Y" reference along with EP 0816837 A against claims 6-8. Claims 1, 3-6, 9-11, 13, and 14 have been rejected above under 35 U.S.C. 102(b) as being anticipated by WO9961888A. Claims 2 and 12 have been rejections above under 35 U.S.C. 103(a) as being obvious over WO9961888A. Neither WO9961888A nor EP 0816837 A discloses the additional limitations of claims 7 and 8.

British Search Report for application GB 0215779.0 ("GB Search Report")

14. The GB Search Report only cited "A" references.

Allowable Subject Matter

15. Claim 8 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

16. The following is a statement of reasons for the indication of allowable subject matter:

a) Claim 8: the combination of limitations requires the voltage control means to comprise "a diode chain connected between the voltage source and earth, at least one subsidiary channel at a branch point being switchably connected to at least two alternative points in the diode chain so as to provide first and second configurations, the potential difference along the subsidiary channel in a region of the branch point in the first configuration having opposite polarity to the potential difference along the subsidiary channel in a region of the branch point in the

second configuration." The International Search Report for International application PCT/GB03/02926 cited WO9961888A and EP 0816837 A as "Y" references against claim 8. Apparently, EP 0816837 A in the European Examiner's view teaches the claimed diode chain. EP 0816837 A does not, though, discloses a diode chain. EP 0816837 A discloses a voltage divider made up of a chain of resistors. See col. 14:21-43.

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX NOGUEROLA whose telephone number is (571) 272-1343. The examiner can normally be reached on M-F 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, NAM NGUYEN can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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June 11, 2007